

# SYNTAX

SERVING  
THE TIMEX-SINCLAIR FAMILY  
OF PERSONAL COMPUTERS

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## IN THIS ISSUE

|                          |       |
|--------------------------|-------|
| 8K Programs              |       |
| Monthly Calendar.....    | 5     |
| Significant Figures      |       |
| Subroutine.....          | 16    |
| Beginning Programming    |       |
| ZX81 Math.....           | 8     |
| Classified Ads.....      | 20    |
| Dear Editor.....         | 12    |
| Hardware Review          |       |
| ZX99 Tape Controller..   | 19    |
| Machine Code Programming |       |
| Testing Bits for         |       |
| Branching.....           | 19    |
| Math Function Execution  |       |
| Time.....                | 16    |
| Maximize Display File    |       |
| for MC.....              | 5     |
| News, New Products..     | 1,2,3 |
| Program Corrections....  | 17    |
| Program Improvements...  | 17    |
| Report on the Spectrum.. | 7     |
| Software Review          |       |
| Multifile.....           | 9     |
| Subscription Info.....   | 23    |
| TS1000 Test and Review.. | 6     |
| TV Sync Solution.....    | 6     |
| Users' Groups.....       | 14    |

## Index of Advertisers

|                         |          |
|-------------------------|----------|
| Byte-Back.....          | 9        |
| Gladstone Electronics.. | 15       |
| Memotech Corp.....      | 4        |
| Robill Products.....    | 16       |
| Softsync Inc.....       | 3        |
| Sinclair Research..     | 10,11,18 |
| Zeta Software.....      | 7        |

SQ, SYNTAX QUARTERLY, is coming in November! All SYNTAX subscribers get the first issue free.

## ATTENTION TS1000 OWNERS

All information about ZX81s in SYNTAX also refers to Timex-Sinclair 1000s. The only difference between the machines is that TS1000s come with 2K RAM; ZX81s come with 1K.

## BASICARE OFFERS ZX81 MEGABYTE MEMORY DECODING

In late August BASICare of London introduced their Organic Micro system for ZX81s. It consists of stackable modules, including a memory mapping device to extend ZX81 address space to 1M bytes (£29.95), 2K-64K RAM (£19.95-64.95), 24 input/output lines (£22.95), ultra-low power memory backed by battery for nonvolatile program/data storage (£32.95), and more. No US dealer now, but you can buy direct. BASICare Microsystem Ltd., 5 Dryden Ct., London SE11 4NH, UK.

## ROSETTA STONE NOMINATIONS BEING ACCEPTED

Nominations are open for the 2nd annual Rosetta Stone award, given for the best independent product (application, software package, peripheral) for ZX/TS computers. Send your nominee's name, address and phone number to SYNTAX, RD 2 Box 457, Harvard, MA 01451 before 31 Dec 82. This year's prize, sponsored by Mindware Inc. of Wayland, MA, will be awarded by SYNTAX editors. Last year Dr. Ian Logan won for his 8K ROM disassembly.

## QSAVE CUTS SAVE/LOAD TIME

QSAVE, a 2-part package, drastically cuts your ZX81 SAVE/LOAD time. The software increases the baud rate, or data transfer, of ZX81s to 4000, saving or loading 16K in 29 seconds. It also provides a program verify to check for good save. The QSAVE hardware is a 2-stage amplifier/filter. \$30 US includes postage. Personal Software Services, 112 Oliver St., Coventry UK CV6 5FE.

## NEW PRODUCTS AND SERVICES

Ed. note: Unless specified, all ZX81-related products should work with Timex-Sinclair 1000 computers.

F/22 Press has cut the price of their DARKSTAR darkroom program complete package (DARKSTAR on tape with documentation, ZX81, 16K RAM, 12" TV monitor, tape recorder) from \$550 to \$475 (includes delivery in continental US. F/22 Press, PO Box 141, Leonia, NJ 07605.

NIM Electronics plans to introduce a ZX81 keyboard/enclosure kit in late September. It consists of an aluminum enclosure which mounts the ZX81 PC board and a keyboard with ZX81 legends on the sloping front surface. Assembly time, according to Ronald Kern, is about 20 minutes, no soldering. Price: \$150. NIM Electronics, 1 Denise St., Parlin, NJ 08859, 201/721-0070.

Find over 600 ZX-TS products listed in The Sinclair Computer Family Sourcebook. Each listing gives a description, prices, computer requirements and suppliers' names and addresses. First revision, \$6.95+ \$1.25 postage, 93 pgs. New editions are planned about every six months, according to Randy Hecht. Atlantic Computer Products, 5 Main Plaza Suite 1424, United Virginia Bank Building, Norfolk, VA 23510.

Eliminate heat-related problems with the Power-Pack. It gives two outputs: a fixed +5V at 1.2 amps and a screwdriver-adjustable +6.5-+15V. It also includes a push button to clear the computer, a LED power-on indicator and the connecting plug and cable. Full hookup instructions included. The Power-Pack is housed in a 5x4x3" aluminum enclosure and the 120VAC-60Hz input is fused for safety. Price is \$37.50 + \$3.50 shipping. CA res. add 6.5% MacSwan-Packaging Co., POB 4697, Downey, CA 90241.

Independent Sinclair service: Tercentennial Technical repairs Sinclair computers for a flat \$35 rate plus shipping via UPS. Your repair is guaranteed for 30 days. According to manager Jack MacGrath, average turnaround time is 2-3 days. Send your machine by UPS with a description of the problem, check or mo., and your name, address and telephone number. Tercentennial Technical, 70 Tercentennial Dr., Billerica, MA 01821, 617/667-8272.

Get ready for the office pool--PICK'EM predicts winning football teams and point spreads in the NFL on your 8K/16K Sinclair. On tape, \$9.95 plus \$1.50 postage. Stuart Software, 25381-G Alicia Pkwy Suite 316, Laguna Hills, CA 92653.

Norris Radio & Electronics have now expanded their repair services to the continental US (Jun.82). They repair out of warranty ZX81s (kit and assembled) and TS1000s for \$8.50/hr plus parts. Turnaround time is about 48 hours. Norris Radio & Electronics, 144 Terry Dr., Slidell, LA 70458.

ZX Hardware Team of the ZX Users Group of New York offers inexpensive 64K memories: \$135 to club members and \$150 to nonmembers, plus \$5 postage. ZX Hardware Team, Box 560, New York, NY 10005.

Winky Board cassette loader/duplicator interface includes LED level monitor, earphone eavesdropper and interference filter, plus circuits for direct-copying any ZX/TS tape (even programs that can't be listed or saved). Only 1x1.5", Winky Board needs no power or computer mods, won't interfere with extra memory. Info free. Assembled and tested, \$18 ppd. Kit, \$12 ppd. PA residents add 6%. Overseas add \$2, pay by international M.O. in US dollars. G. Russell, RD 1 Box 539, Centre Hall, PA 16828.



Add-a-Switch is an on/off switch for your ZX81 or TS1000. It installs instantly with no mods and eliminates plug and jack failure. Price: \$14.95. Robert Downs, Lyon Ware, 1520 S. Lyon, Santa Ana, CA 92705, 714/835-9512.

Fulcrum's ZX81 Loading Aid helps load tapes first time. It plugs between ZX81 and tape recorder, using LED indicators to let you correct recorder volume. Unit with full instructions \$21. Special versions for ZX80s and ZX Spectrums (specify when ordering). Fulcrum also offers ZX/Spectrum Software--short sleeved T-shirts with Sinclair ZX81 or Spectrum lettering. Red on black or white, S,M,L,XL children's and adult's, \$7. Improved Keyboard Bleeper gives short Bleep with any keypress. Unit fits under keyboard or ZX PC board, no soldering. \$19. Fulcrum Products, Hillside, Steep Ln., Findon, Worthing, West Sussex BN14 0UF.

RIP: QZX, the ZX newsletter for amateur radio users, is ceasing publication because its publisher can no longer handle the load. If you're interested in putting out QZX, write to Marty Irons, K2MI, 46 Magic Circle, Goshen, NY, with "Replacement for QZX" in big letters on the envelope.

#### PROGRAMMING CONTEST

Computer Engineering Services is sponsoring a Sinclair ZX programmers' contest. First prize is \$150, 2nd \$75, 3rd and 4th a year's subscription to SYNTAX. Programs must be original and written for ZX80 with 8K ROM, ZX81 or TS1000, in 1K, 2K or 16K (specify configuration). Rewrites from other BASICS may be considered. Entry deadline is 15 Oct 82. For complete rules and entry forms, write Computer Engineering Services, The Jarrett Company, PO Box 1222, Show Low, AZ 85901.

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### ZX81 & TS1000 SOFTWARE

#### GRAPHICS KIT 16K

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Reverse - converts all characters to their inverse video.

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Up, down, left, right: alter your next print position in the direction indicated.

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Square - draws a square or rectangle from your specified co-ordinate.

All these routines are in machine code for SUPER-FAST response. Simply load GRAPHICS KIT, which repositions itself at the end of your RAM, and then your own program (or key in a new one).

GRAPHICS KIT occupies slightly over 2K at the top of your 16K RAM and that includes space to load the programmer's TOOLKIT described below. On loading, it repositions RAMTOP (see your ZX81 or TS-1000 manual) so it is protected from NEW and from being over-written by your own program.

16K \$14.95

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Line renumber - you state starting number and increment value. Free Space - tells you how many free bytes you have left. Search and replace - changes every occurrence of a character as you require.

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Also includes all the above plus: GOTO's and GOSUB's included in line renumber. Search for and list every line containing specified character.

An incredible achievement!!

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These 2 unique Toolkits are written as "compatible" and can therefore be loaded in together. When loading The Programmer's Toolkit on its own the user has first to enter a poke code. However when used with the Graphics Kit, which is loaded first, the poke code is not needed.

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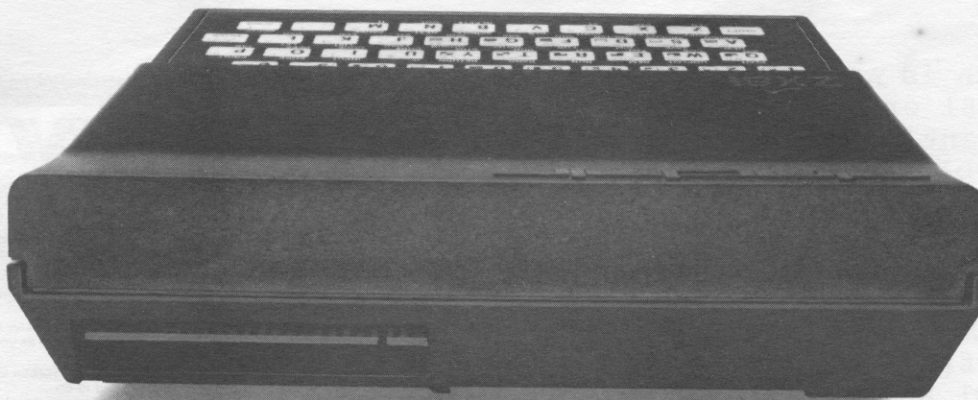
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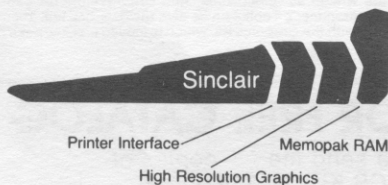
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**Memopak High Resolution Graphics** The Memopak HRG contains a 2K EPROM monitor and is fully programmable for high resolution graphics. The HRG provides for up to 192 by 248 pixel resolution.

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**New products coming soon** Memotech will soon be introducing four new Sinclair compatible products: a high quality, direct connection keyboard, a digitizing tablet, a 16K EPROM and a disk drive. Watch for our future advertisements.

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## MONTHLY CALENDAR

This 8K/16K program displays a calendar for any month in any particular year. It uses equations developed by Zeller, the astronomer, to determine the day that the desired month begins on. To run, simply type in the program, press RUN, and select the desired month and year for the calendar. This program accepts the data and determines the name of the month (lines 1-210). Next the program determines the number of days in the requested month and checks for a leap year (lines 240-420). Finally the program displays the final calendar. To display another month, simply press RUN again and enter the necessary information. There are no special instructions for exiting; the program does so automatically.

Herb Cohen, Winchester, KY

```

1 REM CALENDER
5 FAST
10 PRINT "ENTER MONTH (1 TO 12)
"
20 INPUT M
30 PRINT "ENTER YEAR"
40 INPUT Y
50 LET D=1
60 LET MON=M
70 LET YEAR=Y
80 DIM A$(12,9)
100 LET A$(1)="JANUARY"
110 LET A$(2)="FEBRUARY"
120 LET A$(3)="MARCH"
130 LET A$(4)="APRIL"
140 LET A$(5)="MAY"
150 LET A$(6)="JUNE"
160 LET A$(7)="JULY"
170 LET A$(8)="AUGUST"
180 LET A$(9)="SEPTEMBER"
190 LET A$(10)="OCTOBER"
200 LET A$(11)="NOVEMBER"
210 LET A$(12)="DECEMBER"
220 DIM A(42)
230 LET END=30
240 IF M=1 OR M=3 OR M=5 OR M=7
OR M=8 OR M=10 OR M=12 THEN LET
END=31
250 IF M=2 THEN LET END=28
260 LET LEAP=0
270 IF Y/4=INT (Y/4) AND Y/100<
>INT (Y/100) THEN LET LEAP=1
280 IF Y/400=INT (Y/400) THEN L
ET LEAP=1
300 IF M=2 AND LEAP=1 THEN LET
END=29
310 IF M=1 OR M=2 THEN LET M=M+
12
320 IF M=13 OR M=14 THEN LET Y=
Y-1

```

```

330 LET R=D+2*M+2+INT ((3*M+3)/
5)+INT (Y/4)+Y-INT (Y/100)+INT (
Y/400)
340 LET NUM=(R/7-INT (R/7))*7
350 LET NUM=INT (NUM+.5)
360 LET START=NUM
370 IF NUM=0 THEN LET START=7
380 LET DAY=1
390 FOR P=START TO 42
400 LET A(P)=DAY
410 LET DAY=DAY+1
420 NEXT P
430 CLS
440 PRINT TAB 10;A$(MON);"B";YE
AR
450 PRINT
460 PRINT "      SUN MON TUE WED
THU FRI SAT"
470 FOR R=0 TO 5
480 FOR C=1+R*7 TO 7+R*7
490 LET CC=C-R*7
500 IF A(C)=0 THEN PRINT TAB (4
*CC);"B";
510 IF A(C)=0 THEN GOTO 550
520 IF A(C)>END THEN PRINT TAB
(4*CC);"B";
530 IF A(C)>END THEN GOTO 550
540 PRINT TAB (4*CC);A(C);
550 NEXT C
560 NEXT R
570 STOP
SYNTACTIC SUM: 19602 ,8K

```

MAXIMIZE DISPLAY FILE FOR MC

I upgraded my ZX81 to 2K of RAM. Lately I have been interested in programming machine code displays. The problem is that since my machine has only 2K RAM it always sets up a minimal display file. (See ch.27 p.129 in the BASIC manual.) To do any kind of MC display you cannot have a minimal display file. I used to use a short routine that would PLOT a line up the right side of the screen. This "opened" the display and allowed a MCD. This was slow and tiresome to do.

I remembered the BASIC manual states that if you had more memory you could POKE RAMTOP lower than 3.25K to fool CLS into setting up a minimal display file. So I figured why not go the other way, that is, POKE RAMTOP higher than 3.25K to fool CLS into a full display. It worked! I have used my computer for a while this way and no crashes or problems whatsoever.

The procedure for POKEing RAMTOP is somewhat different than the manual states: once you power

up, POKE 16389,78 and then CLS. Wait for a moment and voila, cursor and a full display. (To verify this, try POKE 16520,6.)

Remember, a full display will occupy 793 bytes of RAM. This may be no good for 1K machines. Also if you execute a NEW you must re-POKE RAMTOP to get a full display again. You can switch between minimal or full display file by POKEing RAMTOP at any time during programming. I use POKE 16389,72 for a minimal display and POKE 16389,78 for a full display.

John Guineau, Marlboro MA

#### TV SYNC SOLUTION

If your ZX81 display has dim lines and horizontal distortion moving up or down the screen, it's not synchronizing with the TV horizontal sweep. A simple component change on the Sinclair circuit board will solve the problem.

Here's what's happening: The ZX81 uses a 6.5 MHz ceramic filter as the frequency-determining element in the oscillator (clock). The filter is loaded with a 100 pF capacitor (C6) to reduce the frequency to about 6.3 MHz. When the Sinclair Logic IC divides this down, the TV horizontal sync frequency (15750 Hz) is obtained. The tolerances on both the ceramic filter and the capacitor are large enough to produce a sync frequency that may be outside the lock-in range of the TV horizontal sweep circuit. If the sync frequency produced by the computer is too high, the lines move down; if too low they move up. To correct the situation and get stable lock, just change the value of C6. To reduce the frequency, increase C6. Tack-solder small-value capacitors across C6 on the bottom of the circuit board. Start with a 10 pF. Increase it until the lines disappear. Trim the leads on the final capacitor to about 3/4 inch, insu-

late them, permanently solder the capacitor, and position it parallel to the board. If the frequency is low, you'll have to replace C6. Substitute a 10-20 pF capacitor to make the frequency too high, then follow the preceding steps.

In my case, the horizontal sync frequency was about 15600 Hz. A new C6 value of 57 pF locked the sync in solidly.

Larry Forman, Santa Barbara, CA

#### TS1000 TEST AND REVIEW

Syntax bought a Timex-Sinclair 1000 and TS1016 (16K RAM pack) from a discount house. (We have a partial list of Timex computer outlets. If you can't find one, call us.) The prices weren't discounted --\$99.95 for the computer and \$49.95 for the RAM.

Our TS1000 performs flawlessly, even running continuously for 24 hours. Our RAM pack developed occasional crash problems after a few hours. We saw symptoms such as numeral 4 and graphic symbols on the display followed by system crash when we pressed BREAK, and unrecoverable loss of display sync. Another RAM brought by an acquaintance would not execute its startup routine. Our RAM healed itself, and has shown no problems for days.

Timex provides a 1-Amp power pack with low ripple and heating.

With the TS1000 comes a 3-program starter tape. It loads easily, but poorly introduces TS capabilities. The programs are Life (esoteric math simulation), Maths (arithmetic test program) and Averages (mean and median demo). All run in 1K RAM. Life crashes in 16K, and the directions should say press X, not C, to clear.

Instructions (in minute type) are unclear (for example, press newline after each entry--key is labeled ENTER). Tell friends who buy TS machines to read the manual before trying the starter tape.



## A REPORT ON THE SPECTRUM

Sinclair's new color machine, the Spectrum, has been available in the UK for several months; no word when it will cross the Atlantic.--AZ

The Spectrum is a ZX81 that has been developed by adding a hi-resolution display, color board, improved cassette interface and larger keyboard. These features are available to ZX81 owners but increase the cost considerably and make the fragile ZX81 more difficult to use. Now they are standard, giving the Spectrum a robustness sorely lacking in earlier Sinclair models.

Drawbacks? Again the keyboard. Despite its improved nature, it is still a small calculator type keyboard and not for fast typing. And the display has only 768 color areas, clearly a compromise.

Comparing the operating systems of the ZX81 and the Spectrum, I find several fundamental changes. No longer is the display produced in software. The ULA is mainly responsible for scanning the 6K of memory (block 4000-57FFh) that holds the bit pattern for the memory-mapped display. This scanning is done between Z80 access periods. The ULA also scans the "attribute area." This 0.75K area of RAM (block 5800-5AFFh) holds the color information for the 768 character areas of the display. Each attribute byte can describe 1 of 8 "ink" colors, 1 of 8 "paper" colors, 1 of 2 brightness states and flash-on or flash-off. The names "ink" and "paper" are generally considered "foreground" and "background" on other machines. Overall, the Spectrum has 16 colors if you consider the bright colors different from the normal colors.

No longer is the keyboard scanning done in the display routine. Now the maskable interrupt system scans for key presses every 1/50th (UK) of a second and enters

## NEW! ZX81 16K RAM NEW!

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the appropriate value into the system variable LAST\_K.

No longer are the input/output routines almost inaccessible. Now the appropriate routine addresses are available as "channel information," which is in effect a vector table in RAM.

But what is the same?

The BASIC interpreter is virtually untouched. The new features (multiple statement lines, multiple INPUT lines, the provision of READ, DATA, RESTORE and DEF FN) have just been melded in. The floating-point calculator is also much the same as in the ZX81. But there is some integral arithmetic and FOR-NEXT loops using integers run 20% faster than otherwise. The cassette format is also the same insofar as there are no parity bits or checksums. But the new standard is most impressive and allows for programs, arrays and blocks of code.

Ian Logan, Skellingthorpe, UK

## BEGINNING PROGRAMMING--ZX81 MATH

Computing newcomers often face new terminology. This article expands on bits, bytes and binary numbers over the ZX81 and TS1000 manual.

An elementary understanding of the mathematics involved with your computer will help you get the most enjoyment and use out of it. Your computer is a digital machine, or "number cruncher." When you press a key, whether it is an alpha character (letter), graphic symbol or numeral, it is immediately converted to a numerical value. If you hate math, don't quit yet--we'll start at the beginning.

When we count up from 1, we run out of single digits after 9. So we go to double digits. The number 10 means one ten and no ones; 11 means one ten and one one, and so on. You understand the meaning of each digit by its position in the numeral.

Let's look at the numeral 6382, read six thousand three hundred and eighty-two. We can break it down like this:

$6382 = (6 \times 1000) + (3 \times 100) + (8 \times 10) + (2 \times 1)$   
The number 1000 is the same as  $10 \times 10 \times 10$ , or 10 cubed. It can be written symbolically as  $10^3$  (10 raised to the third power). The 3 in  $10^3$  is called the exponent and is written to the right and above the number being raised. Since we cannot enter an exponent this way on the ZX81, the symbol \*\* (shifted H) is used, eg.,  $10^{**}3$ . We can now write the equation for our number using exponents:

$6382 = 6 \times 10^3 + 3 \times 10^2 + 8 \times 10^1 + 2 \times 10^0$   
As you see, 10 raised to the zero power equals 1. Try it on your computer (PRINT  $10^{**}0$ ). So our usual number system consists of 10 digits and is based on 10 raised to a power, said to be base 10. We call this system DECIMAL, or more correctly, DECIMAL NOTATION.

Your computer consists of thousands of transistors used as

electronic switches. A switch has only two positions, on and off. So the number system used to express what's happening within the computer is quite different from the decimal notation we are used to. Because a switch has only two states, we need only two digits, 0 and 1, and our number system will be base 2. This system is called BINARY. A BINARY digit is called a bit. Let's take the 4-bit binary number 1101 and express it in exponential form as we did to the decimal number. Remember that a binary number is in base 2.

$$\begin{aligned} 1101 &= (1 \times 2^3) + (1 \times 2^2) + (0 \times 2^1) + (1 \times 2^0) \\ &= 1 \times 8 + 1 \times 4 + 0 \times 2 + 1 \times 1 \\ &= 8 + 4 + 0 + 1 \\ &= 13 \text{ in decimal} \end{aligned}$$

By putting a binary number in exponential form we can convert it to its decimal equivalent. But how do you go from decimal to binary? If you don't have a computer program to do it for you, you can use the method of successive subtraction of powers of two. The name is the worst part. Let's take the decimal number 13. Start by finding the largest power of 2 that will divide into 13. Then divide the remainder by the next lower power of 2:

$$\begin{array}{rcll} 2^4 &= 16 & 13/16 & \text{Too Big} \\ & & 2^3 & 2^2 & 2^1 & 2^0 \\ 2^3 &= 8 & 13/8 &= 1 & \text{remainder } 5 & 1 \\ 2^2 &= 4 & 5/4 &= 1 & \text{remainder } 1 & 1 \\ 2^1 &= 2 & 1/2 &= 0 & \text{remainder } 1 & 0 \\ 2^0 &= 1 & 1/1 &= 1 & & 1 \end{array}$$

So decimal 13 = binary 1101.

The Z80 microprocessor chip used in the ZX81 and TS1000 is an 8-bit device, meaning that it can handle 8 binary digits of data at one time. This grouping of 8 bits is called a byte. So we can say that each memory location in our computer is a byte wide. When we express a byte in binary notation, it is customary to write all 8 bits, even though there are leading zeros. For example, binary 1 is written as 00000001.

William Wentz, Rio Rancho, NM



## SOFTWARE REVIEW

Product: MULTIFILE--A Data Storage System

Price: \$29.95

ROM/RAM required?: 8K/16K

Printed listing?: No

Program listable?: Yes

Screen prompts?: Yes

Easy to Load?: OK

Display?: Very good

From: Gladstone Electronics, 1585

Kenmore Ave., Buffalo, NY 14217

Multifile arrives with the program tape, 10 pages of photocopied instructions, 3 blank tapes, and a 4-tape cassette album. The instructions are lengthy, but thorough. You should have no problems operating the program or understanding its structure after reading these pages carefully.

Multifile is menu-driven. You set up the parameters of whatever files you care to make. After completing the setup the files are dimensioned and you are ready to go. The menu lists the number of available files in the upper right corner, so you always know how much space is left.

You can call up the files by any item in the file as well as by number. Once a file is on the screen, you can copy it to the printer, continue searching for another file with the same key, or return to the menu.

One of the program's most interesting features is the "security lock." It is a two-letter key to enter the program. You must press the code in order and at the right interval to enter the program. Without the code, you cannot enter at all. If you have something to keep confidential, this program is for you.

I found the program tape balky to load, but once finally loaded and copied onto my own tapes, it is easily retrievable. There is one big note to make. The C-10 tapes sent with the program are not long

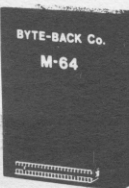
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LEESVILLE, SOUTH CAROLINA 29070

CHECKS



enough to record the program once it is dimensioned. They will hold 12-13K, but not the full 16K.

Multifile can be listed and modified. I made several small changes in the program for some specialized applications. My favorite changed the menu to not only tell you the files left open, but to tell how many you used, how many are left, and the total available. This can be done by changing only one line.

In summary, I found the program useful for a variety of applications. The security lock was a big plus, and, since it can be listed you can learn from the program as well. It is well worth the investment of \$29.95.

Michael Roberts, Des Moines, IA

Our Multifile tape has 1 copy each side. One loaded; one didn't. Gladstone always replaces defective tapes.--AZ

# ZX81



## Introducing the Sinclair ZX81.

If you're ever going to buy a personal computer, now is the time to do it.

The Sinclair ZX81 is the most powerful, yet easy-to-use computer ever offered for anywhere near the price: only \$99.95\* completely assembled.

Don't let the price fool you. The ZX81 has just about everything you could ask for in a personal computer.

### A breakthrough in personal computers.

The ZX81 is a major advance over the original Sinclair ZX80—the first personal computer to break the price barrier at \$200.

In fact, the ZX81's 8K extended BASIC offers features found only on computers costing two or three times as much.

Just look at what you get:

- Continuous display, including moving graphics

# THE \$99.95 PERSONAL COMPUTER.

- Multi-dimensional string and numerical arrays
- Mathematical and scientific functions accurate to 8 decimal places
- Unique one-touch entry of key words like PRINT, RUN and LIST
- Automatic syntax error detection and easy editing
- Randomize function

useful for both games and serious applications

- 1K of memory expandable to 16K
- A comprehensive programming guide and operating manual

The ZX81 is also very convenient to use. It hooks up to any television set to produce a clear 32-column by 24-line display. It comes with a comprehensive programming guide and operating manual designed for both beginners and experienced computer users. And you can use a regular cassette recorder to store and recall programs by name.



### Order at no risk.\*\*

We'll give you 10 days to try out the ZX81. If you're not completely satisfied, just return it to Sinclair Research and we'll give you a full refund.

And if you have a problem with your ZX81, send it to Sinclair Research within 90 days and we'll repair or replace it at no charge.

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If you really want to save money, and you enjoy building electronic kits, you can order the ZX81 in kit form for the incredible price of just \$79.95.\* It's the same, full-featured computer, only you put it together yourself. We'll send complete, easy-to-follow instructions on how you can assemble your ZX81 in just a few hours. All you have to supply is the soldering iron.

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The ZX81 represents the latest technology in microelectronics. More than 10,000 are sold every week. In fact, the ZX81 is the fastest selling personal computer in the world.

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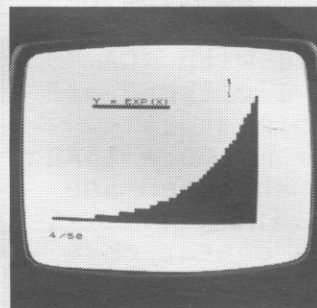
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Ask for operator #509.  
In Ohio call: 800-582-1364;  
in Canada call: 513-729-4300.  
Ask for operator #509. Phones open 24 hours a day, 7 days a week. Have your MasterCard or VISA ready.

These numbers are for orders only. If you just want information, please write: Sinclair Research Ltd., 2 Sinclair Plaza, Nashua, NH 03061.

\*Plus shipping and handling. Price includes connectors for TV and cassette, AC adaptor, and FREE manual.

\*\*Does not apply to ZX81 kits.



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# sinclair

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|-----------------------|---------|------|--------|
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| ZX81 Kit              | 79.95   |      |        |
| 16K Memory Module     | 49.95   |      |        |
| Shipping and Handling | 4.95    |      | \$4.95 |
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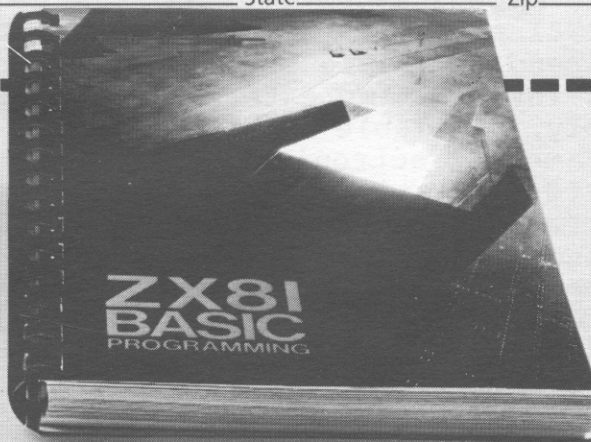
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\*U.S. dollars



## DEAR EDITOR

Brian O'Brien of Weston, MA, suggested keeping the TV away from the recorder to avoid picking up the TV's 15KHz noise. To lengthen my SAVE and LOAD cables, I got two 36" long stereo cables with RCA plugs at both ends. I clipped off the plugs and added miniature plugs. At 36" I have no more 15KHz hum! The cables are shielded and help prevent outside interference. Be sure to solder the center core of the cable to the center lug of the miniature plug. I put black electrical tape on one to distinguish it from the other.

The female connectors inside the computer are just not strong enough to hold plugs firmly. When you move cables, computer or recorder, one or more of the plugs may come out--usually the power plug! Wind a tiny strip of masking tape around plug bases. You'll need a bit more pressure to get the plug in and out. This is a cheap and dirty alternative to replacing the female connectors as Ron DeBalko suggested (Jun.82).

Steve Schowiak, Hielbronn, Germany

I read with trepidation about others' problems with system crashes, TV interference, glitches, overheated voltage regulators, excessive line ripple and so on, but I didn't expect every one of those to appear at my doorstep the day my ZX81 arrived. My solution was to spend \$19.95 to build a regulated 0-15V, 1.5 amp external power supply, available in kit form from Jameco Electronics, Belmont, CA 94002. I haven't had a glitch or crash since and can run my ZX81 over 16 hours with stacked RAM packs (for 32K), even though current drain reaches 700-800 ma with stacked RAMs. Try that with Sinclair's power adapter! Jameco gives exceptional service. In-stock items take less than 10 days,

even if you pay by personal check.

I cured the TV interference by using ordinary coax TV cable properly terminated with a 50 Ohm resistor. I now hook up directly into my TV through the 50 Ohm coax connector, by-passing Sinclair's antenna switch. Voila, a display that is actually readable.

Joseph Dominiecki, Wisdom, MT

I hope no one got electrocuted following Martin Oakes' suggestion to connect their wrists directly to earth ground in his Simple 4K-8K ROM Switch (Jul.82 p.8). Static damage is a real danger. However, the human body acts like a 60 pico-Farad capacitor for static electricity and all that is needed is a resistive path to ground to bleed off static charge. Place a 200K-1 megohm resistor (1 watt carbon comp--big for mechanical strength) in series with the ground wire. Likewise connect exposed metal or conductive mats to earth ground through the same or similar resistors to drain static charge without shock hazard. A short stroll across a carpet can build up 10000-50000V charges on a body. When the relative humidity is over 60%, this charge dissipates slowly through the air. When the RH drops below 30% the charge lingers. A 1 megohm wristat drops that to 100V in 1/10th second or less. Field effect devices (CMOS, J-FETS, MOS-FETS) and some bipolar devices fail with voltages (on 60 pF) as low as 100V. So protect that RAM or ROM, but don't wipe out the user!

Dave Rogers, Santa Barbara, CA

Is it possible to merge several utility programs from cassette to ZX81? I'd like to load a renumber program and an input program (replacing READ, DATA, RESTORE) before entering a new program.

Ross Shuping, Greenville, NC



The Data-assette ZX99, reviewed this issue, lets you do this. To do it with software, check out Siriusware's classified ad this issue.--KO

---

Between the 8K ROM and the RAM is 8K of "dead space." Is it possible to put more RAM in that area, or even an EPROM? Or does Sinclair have other plans for this area?

Dave Straub, Petaluma, CA

Memotech's 64K RAM puts 8K in this space. The CAI/O board and Data-assette's ZX99 use ROMs here, as do a myriad of other manufacturers. We know of no Sinclair plan to use addresses 8K-16K on ZX81s. You can place your own EPROMs in here. Memotech plans to sell blank EPROMs this fall (Aug.82).--KO

---

As you know, there is a multitude of ZX81 software in all areas. To choose among the array, I'd like to suggest that manufacturers show a screen display in their catalogs. It's easier to visualize a program with sample video.

Mark Rogstad, Wheaton, IL

---

I have a ZX81 with Memopak 64K RAM. Normally, even with RAMTOP and the machine stack at 65535, you can enter only about 15K of BASIC lines. Entering more lines causes a crash when the top of the display file (VARS minus 1) reaches 32768 (8000 hex). I found if I move the entire display file beyond 8000h in a single operation in FAST mode, I can add another 16K of BASIC lines for a total of about 31K.

You can do this easily with a method like Frank O'Hara's (Aug. 82). Insert, say, a 2K-long dummy REM line into a program containing 14-15K of BASIC. Once you have added another 2K of your BASIC program you can safely delete the dummy REM line; as long as the lower end of the display file

(D\_FILE) does not drop below 8000h during subsequent editing, the system runs perfectly. In other words, the display hardware can handle the file when it is entirely between 4000 and 8000h or between 8000 and C000h, but not when it is partly in one block and partly in the other. This trick does not seem to work beyond 48K (C000h). I don't know if other brands of 32K+ RAM will behave similarly.

When you have a long REM line in a program, it's a good idea to put another line of only a REM right after it. Attempting to delete the line immediately following one that is too long to fit on the screen causes a system crash.

Peter Ulrich, New York, NY

---

After much frustration trying to share my recorded programs with a ZX81-toting friend, I discovered the alignment of the recording head of my Panasonic mini had gone askew. It was merrily recording at its own crazy angle, oblivious to all that is universal and expected of a machine of the eighties.

No problem to correct it--an adjusting screw is generally visible with the recorder in PLAY mode and the tape door open. With a small screwdriver, adjust the head angle to give the loudest sharpest sound when playing back a program. This method may help coax an old recorder into service.

Tom Gill, Milwaukee, WI

---

Last May 14, Bob Swann (and later a voice named Carol) of CAI Instrumentts promised to send me detailed information about various CAI products. It is 13 weeks since my request--no info.

Ever hopeful, I ordered the CAI/O board and 40-column printer June 7 with shipment promised in 4 weeks. Many weeks and calls to CAI later, no printer and no word from CAI. An order accepted is a con-

tract to deliver. I get only promises and not performance. After nine weeks and no cooperation, I believe your readers deserve to learn the truth about CAI and its misrepresentations.

Christopher Bannister, Hopewell, NJ

Carol from CAI agreed that your order was delayed beyond the original shipment date. This was because of CAI's backlog replacing Widgets with CAI/O boards and 32-column printers with 40-column printers. CAI had problems meeting manufacturing deadlines and have hired another company to make their products. Carol emphasized that CAI does not make promises they know they cannot keep; she recalls saying she would try to get your order out each time you called. She added they are very aware of their shipping problems and are working to correct them. Your printer went out UPS on 3 Aug.--AZ

We all have ordered software and hardware from vendors interested in collecting our money for frequently shoddy merchandise who hope they never hear from us again. I found the opposite with CAI Instruments and Bob Swann. I purchased over a period of time both the original 32-column printer and the new 40-column printer. Being a tyro in this field, I must have called Bob a hundred times, frequently on weekends. I found him extremely courteous, cooperative and helpful in explaining to me the arcane aspects of computer operations. My last experience involved a broken pin on the 20-pin plug connecting the printer and CAI/O board. Within 3 days of my call, two replacement ribbons arrived. If someone gives an award for best equipment support in the field, I will be happy to nominate CAI Instruments and Bob Swann.

Peter Danes, New York, NY

## USERS' GROUPS

Here's our latest list of ZX-TS users' groups. To check for a group in your area not listed here, call or write us (please include a self-addressed, stamped envelope) and we'll tell you of any group we know of. To list your group, call or drop us a line and we'll refer interested people to you. SYNTAX, RD 2 Box 457, Harvard, MA 01451, 617/456-3661.--AZ

**Santa Cruz, CA:** Marc Reinig, High Score Video Arcade, 2301 Mission St., Santa Cruz, CA 95060.

**Petaluma, CA:** Michael & Susan Degsive, 129 Saratoga, Petaluma, CA 94951.

**Laguna Hills, CA:** William H. Brown, 5122 Brazo, Laguna Hills, CA 92653, 714/830-7628.

**Provo, UT:** Quint B. Randle, 255 N. 1600 West #76, Provo, UT 84601, 801/377-4757.

**Lincoln, NE:** Patrick Murphy, 4903 Walker, Lincoln, NE 68504, 402/464-8086.

**Kansas City, MO:** Peter B. Wolcott, 305 W. 51st Terr., Kansas City, MO 64112, 816/753-8546.

**Slidell, LA:** Gulf Coast Sinclair Users' Group, 144 Terry Dr., Slidell, LA 70458.

**Nashville, TN:** William Tracy, 3220 Lakeland Dr., Donelson, TN 37214, 615/889-6668.

**St. Albans, WV:** Sinclair Super Group, William Mecrow, 949 Brier St., St. Albans, WV 25177.

**Palatine, IL:** Diana Wright, 2170 Oak Brook Cir., Palatine, IL 60067, 312/934-9375.

**Milwaukee, WI:** Bob Harris, 2604 N. Murray #203, Milwaukee, WI 53211, 414/963-9675.

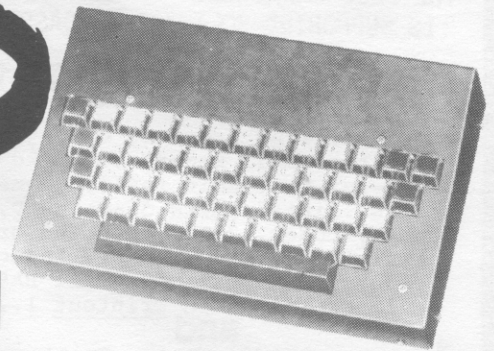
**Newport News-Williamsburg-Hampton, VA:** Jim Langston, 146 Hawthorne Dr., Newport News, VA 23602, 804/877-3920.

**Hopewell Jct., NY:** Mid-Hudson Users' Group, Fr. Bruce O. Bowes, Church of the Resurrection, Hopewell Jct., NY 12533, 914/226-5727.



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- 8-page Editor Manual

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ZXBUG is a powerful tool for machine language programming. It is 4K long and uses memory from 71EO to the top memory. ZX BUG works in hexadecimal (base 16), not decimal, so all addresses are a maximum of 4 Hex bits long. Provides a total of 28 commands.

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### ZX ASSEMBLER

This Machine Code program occupies 7K of memory and locates itself at the top of memory. The program is a full Editor/Assembler and Monitor. Labels may be used instead of any string. The features include Line Insertion/Delete, Insert Characters, Auto Repeat on all keys. The monitor has facilities to inspect memory, registers and run machine code programs.

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FIND. Will find any string of up to 255 characters and list each line containing that string.

REPLACE. Replaces any string of up to 255 characters by any other string.

SAVE. Transfers program in computer to below RAM-TOP.

APPEND. Allows two programs to be joined.

REMKILL. Removes all REM statements from a program, otherwise leaving it unchanged, preserving memory.

Artic \$14.95

## DATA STORAGE SYSTEM

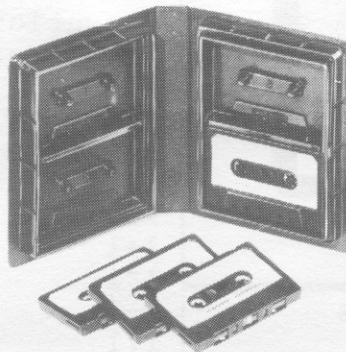
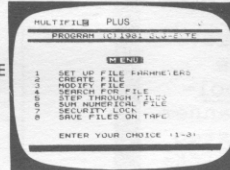
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#### The Complete ZX81 and TS1000 Library!

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| ZX81 Pocket Book .....                          | 10.95   |
| Making the Most of Your ZX81 .....              | 10.95   |
| Computer for Kids, ZX81 Edition .....           | 3.95    |
| Explorers Guide to the ZX81 .....               | 10.95   |
| ZX81 Companion .....                            | 8.95    |
| 49 Exploding Games for the ZX81 .....           | 10.95   |
| Not Only 30 Programs for ZX81: 1K .....         | 14.95   |
| Machine Language Made Simple for Sinclair ..... | 19.95   |
| Mastering Machine Code on your ZX81 .....       | 12.95   |
| ZX81 Rom Disassembly: Part A .....              | 14.95   |
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| Understanding your ZX81 ROM .....               | 19.95   |

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## ZX81 Professional Keyboard and Case

A full-sized professional keyboard for the ZX81 Features 47 keys and a full-sized space bar. Connects to the ZX81 with no soldering required, via a plug-in flexible connector. You can purchase the keyboard only, or the optional metal case that holds both keyboard and ZX81. Expansion devices (i.e. RAM packs, etc) connect to the ZX81 edge-connector which extends from the rear of the cabinet.

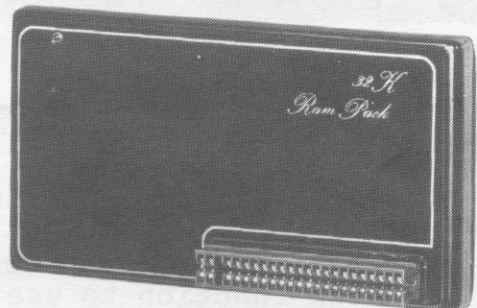
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A very useful, unique Jigsaw memory feature is the pilot light showing if your ZX81 computer/memory is powered.

Larger memory enables longer programs and greater data bases, enhancing the value of your personal computer. And the Jigsaw 32K is part of a fully compatible ZX81 and TS1000 system of add-on products. Additional exciting Jigsaw products to follow shortly!

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**and**

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### MATH FUNCTION EXECUTION TIME

Some calculations take longer than others on my ZX81. I timed each math function to get an idea of which function to use when faced with alternative methods of doing the same calculation and to compare the ZX81 with other computers.

Enter in FAST mode:

```
1 FOR I=1 TO 1000
2 LET T=1
3 NEXT I
```

This program ran in 6.1 seconds against a stopwatch. This is the basic time to execute a FOR-NEXT loop and assignment 1000 times.

I replaced the "1" in line 2 with each function in turn and retimed the program. Deducting the basic loop time gives the time to do each function 1000 times. I calculated the time in milliseconds to perform each function once.

Execution times vary widely, from 4/100000th second to one tenth second. This means some methods of

calculation are better than others. For integer powers up to 50 it is faster to multiply out than use the \*\* function. It takes more memory to multiply to get  $X^{**50}$ , so there is a trade off. Also it's faster to use  $X*0.5$  than  $X/2$ .

I tried using the loop variable I in the calculations but it didn't seem to affect the speed. This leads me to assume that the times in the table are valid for any numbers used with the functions.

By comparison, most pocket calculators and pocket computers take about 200 milliseconds per operation. Typical minicomputers use a few microseconds per operation.

### Execution Times in milliseconds-- ZX81 Math Functions

| Function | Time | Function | Time  |
|----------|------|----------|-------|
| ABS 1    | 0.4  | COS 1    | 40.6  |
| SGN 1    | 0.6  | EXP 1    | 41.3  |
| INT 1    | 1.1  | ARCTAN 1 | 60.9  |
| 1+1      | 1.2  | LN 1     | 65.0  |
| 1*1      | 2.0  | ARCSIN 1 | 69.9  |
| 1-1      | 2.1  | ARCCOS 1 | 72.6  |
| 1/1      | 2.9  | TAN 1    | 81.9  |
| RND      | 11.9 | 1**1     | 105.4 |
| SIN 1    | 39.1 | SQR 1    | 106.4 |

Ron Charlton, Paducah, KY

### SIGNIFICANT FIGURES SUBROUTINE--8K

In scientific calculations the accuracy of a computed value must not exceed that of the least accurately known number used in the computation. You can use the following subroutine (at 1000 in this program) in any program containing the proper input, i.e., SF and Z, to specify the number of significant figures in any expression.

Because the ZX81 holds  $10^{**1}$ ,  $10^{**2}$ , etc., slightly inaccurately (see part 2 of Dr. O'Hara's article, Apr.82), using  $QE=10^{**1}$  might give erroneous results. For example, if SF=6 and  $Z=0.000098765432$ , using  $QE=10^{**10}$  would produce 0.000098765399. In



subroutine 1180, 1E1 through 1E13, which are held exactly, are substituted for 10\*\*1 through 10\*\*13. For Z=0.000098765432 and SF=6, this gives the correct value, 0.0000987654, with the desired number of significant figures. (Note that the ZX81 will not print the last significant figure if it is a zero to the right of the decimal point. It will, however, be counted as a significant figure by the subroutine.)

Use this subroutine as often as necessary by repeating the GOSUB command after assigning each new value to Z. The ZX81 can handle up to eight significant figures.

N. Handshaw Clark, Bryan, TX

```

10 REM "ANY PROGRAM"
20 PRINT "HOW MANY SIGNIFICANT
FIGURES DO YOU WISH?"
30 INPUT SF
40 CLS
50 PRINT "INPUT NUMBER:"
60 INPUT Z
70 CLS
80 GOSUB 1000
90 PRINT Z
100 STOP
1000 REM "SIGNIFICANT FIGURES"
1010 FAST
1020 LET I=SF
1030 GOSUB 1180
1040 LET ESF=QE
1050 IF ABS Z>=(ESF) THEN GOTO 1
120
1060 FOR I=0 TO 30
1070 GOSUB 1180
1080 LET W=INT ((ABS Z+(0.5/QE))
/QE)
1090 IF W<(ESF/1E1) THEN NEXT I
1100 LET Z=(Z/(ABS Z))*W/QE
1110 RETURN
1120 FOR I=0 TO 30
1130 GOSUB 1180
1140 LET W=INT ((ABS Z+(0.5*QE))
/QE)
1150 IF W>=(ESF) THEN NEXT I
1160 LET Z=(Z/(ABS Z))*W/QE
1170 RETURN
1180 LET QE=10**I
1190 IF I=1 THEN LET QE=1E1
1200 IF I=2 THEN LET QE=1E2
1210 IF I=3 THEN LET QE=1E3
1220 IF I=4 THEN LET QE=1E4
1230 IF I=5 THEN LET QE=1E5
1240 IF I=6 THEN LET QE=1E6
1250 IF I=7 THEN LET QE=1E7
1260 IF I=8 THEN LET QE=1E8
1270 IF I=9 THEN LET QE=1E9
1280 IF I=10 THEN LET QE=1E10
1290 IF I=11 THEN LET QE=1E11
1300 IF I=12 THEN LET QE=1E12
1310 IF I=13 THEN LET QE=1E13
1320 RETURN
SYNTACTIC SUM: 60191, 8K

```

SYNTAX ERRORS: In Jason Harper's Printing on the Bottom Line (Aug. 82), line 60 of the second program should read: 60 POKE 16418,2

John Oliger of Indianapolis wrote of the battery back-up project Aug.82: "Mr. Nachbaur refers to part nos. LM340T-5 and 78L05 for the regulator in this circuit. A 78L05 would never work. He should have said a 7805. A 78L05 (in a TO-92 or TO-39 package) is only good for 100ma max. The 7805 is a 1 amp regulator and the LM340T-05 is a 1.5 amp regulator. Both are in the TO-220 package."

Fred Nachbaur wrote that in Fig.2, same article, the arrow identifying the emitter lead of Q1 should be in the top "leg," pointing toward the transistor base symbol. Also, Syncware cut R1 to 62 Ohms, reducing battery warmup after extended use by decreasing battery recharging current. It increases recharge time to about 24 hours--no problem if the unit is just a back-up. Higher values (75 or 81 Ohms) work but increase recharge times.

#### PROGRAM IMPROVEMENTS/REFINEMENTS

To polish Harold Miller's MC screen fill program (Aug.82), change JPNZ at 16522 and 16526 to JRNZs. Since JRNZs are 2 bytes long, the line is just 14 bytes. The same line can fill the screen with different characters from different places in a program without changing the JPNZ addresses. The basic line reads in hex:

3E 80 06 04 0E B0 D7

0D 20 FC 05 20 F7 C9

USR 16514 blackens the screen. If you put 3E 88 18 02 in front of this line, USR 16514 gives a gray screen; USR 16518 a black one. Add any number of 4-byte changes to the front of the line. Increase the code of the 4th byte by 4 for each set and increment USR calls by 4 for each new character fill.

Robert A. Foley, Umatilla, FL

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## MACHINE CODE PROGRAMMING--

### #9: TESTING BITS FOR BRANCHING

You can test any bit in any address simply by loading a register and choosing the right instruction code. This facility is fairly easy to understand and can be used even in very short machine code (MC) subroutines.

For example, if you have a block of data with both positive and negative values less than 128, you can use the instruction BIT 7,A after loading A with a value. If A is positive, the Z Flag will be set to 1; if A is negative, the Z flag will be reset to 0. Then a Test-and-Branch (T&B) can give the value to the correct area for processing.

How does this instruction work? The 7th bit in A, either 0 or 1, "+" or "-", is "inverted" and put into the Z bit of the Flags register. If your T&B is JR Z and the 7th bit of A is 0, then Z will be 0 and control will not jump. Remember that a Flag is "true" if equal to 1, or "set".

Another example: suppose you have a block of data with odd and even values less than 256, and you want the addresses of the odd values. One solution is to set up a loop with HL. (Odd values will have a 1 in bit 0; even values will have a 0 in bit 0.)

The possibilities are endless, so here are some general rules:

1. Select the proper instruction. If the address is important, use BIT n,(HL). If the value is important, use BIT n,register.
2. First, load the proper register (or HL pair) with the value (or address), then test the bit.
3. Follow the bit test with a Test-and-Branch instruction with two possibilities:

A: Bit test fails--continue search loop (Ex. JR Z ;Z=0)

B: Bit test succeeds--Branch to processing area (Z=1) (or, A: JR NZ for branch and B: Continue search loop.)

4. If your data block is used more than once per USR-call, then add a "trigger" value into the last data address for a "value" Test-and-Branch to an area for resetting the address-pointer.

Next month: JUMPING AROUND

Jon Bobst, Zeta Software, PO Box 3522, Greenville, SC 29608-3522

## HARDWARE REVIEW

Product: ZX99 Tape Control System

From: Data-assette, 52 S. 3rd St., Oxford, PA 19363, 215/932-3626.

Price: \$150 (includes cables)

Don't be fooled by the name. This is a tape operating system. And a good one.

Data-assette's ZX99 Automatic Tape Control System can read and write records (called blocks) that let you keep data files separate from programs. You can read in two program tapes, concatenate them and write out a new program tape. You can generate blocks containing only single values or read a 4K tape into a string and write a program to automatically translate it to 8K. In short, you can have most disc functions at low cost.

The hardware is well built; the manual is not. It took me some time to understand that I had to operate the recorders manually in the LOAD and SAVE modes. Selecting recorders turns them on before you can type the LOAD or SAVE commands. Unless you stop them by hand before selection. This mode bypasses ZX99 control and puts you in the normal TS computer mode.

Unless your programs RUN automatically and reset the ZX99, your control program can't LOAD and then stop the recorder--LOADing wipes the control program.

When using the ZX99, you can't use other boards using addresses

8192-16383. You must configure Memotech 64K to select neither the 8-12K nor the 12-16K block; nor can you use printer interfaces with these addresses. This flaw results from incomplete decoding of the ZX99's 2K ROM addresses.

ZX80 owners must work out how to add ROM CS to pin 23B of their machines to use a ZX99.

We tested most ZX99 functions and found them reliable. We ran into some problems caused by (we think) a loose connection. Check the setup carefully: problems show up as oscillations on the recorded tapes, making them unuseable.

Additional memory setups tried created high-frequency noise in the quiet spot on the tape. Sinclair's 16K RAM couldn't write a tape that reloaded--the hash was too loud. Our Memotech 64K and TS1016 made noisy but usable tapes. Our 1K machine produced quiet tapes.

Cables supplied with the system connect the recorders and your computer cables connect the ZX99. You must make your own printer cable to connect a 3.5mm plug and a connector to match your printer.

Listing to a serial printer via the RS232 port is very simple. Define a value (Y) that programs the interface, then call USR 8225 to start the listing. Lines will be your printer's maximum width or 60 columns, whatever comes first. Lines ending in keywords extend past the margin to complete the keyword, but not its argument. You can't create a screen format in the LIST mode. Extra blank lines follow GOTO, STOP or RETURN as an aid.

In BLOCK PRINT mode, a shifted T prints the TS "<>" character which generates a carriage return and line feed for your printer.

In either mode you get full 128 character ASCII output. You can't send from a terminal to the computer. Baud rates from 110 to 9600 are available under software control. Handshaking isn't available, but you can choose even or

odd parity generation. A simple choice in software exchanges the relation of caps and lower case to normal and inverse video.

On our printer (a CDI 1205 terminal) print lines were right-justified in the buffer if "<>" used for CR/LF was at the end of the line. Under these circumstances the right margin wandered about three characters. When LF/CR is at the start of the print line we get left-justified text and stable margins. The 47-page manual failed to explain this and it took several hours to learn.

Data-assette told us a minor ROM bug was found and all early buyers got free upgrades.

Despite its limitations, this is a powerful add-on to your ZX/TS. Syntax has seen no other program development aids that allow this level of flexibility.--KO

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